

\* \* \*

**WHAT IS CLAIMED IS:**

1. A communications system for transmitting and receiving a carrier communication signal carrying a voice signal indicative of voice information and a tone signal indicative of data information, comprising:
  - 5 transmission means for transmitting said carrier communication signal carrying said voice signal and said tone signal; and
  - receiving means for receiving said carrier communication signal carrying said voice signal and said tone signal transmitted by said transmission means,
- 10 said transmission means including:
  - a voice inputting unit for inputting said voice information therethrough to generate said voice signal indicative of said voice information;
  - a data inputting unit for inputting said data information therethrough;
  - a tone signal generating unit for generating said tone signal indicative of said
- 15 data information on the basis of said data information inputted by said data inputting unit, said tone signal having a plurality of tones each having a signal level and repeated at predetermined time intervals;
  - a mixing unit for mixing said voice signal generated by said voice inputting unit and said tone signal generated by said tone signal generating unit to generate a communication signal carrying said voice signal and said tone signal;
- 20 a modulating unit for modulating said communication signal carrying said voice signal and said tone signal generated by said mixing unit with a carrier signal to generate a carrier communication signal carrying said voice signal and said tone signal;
- 25 a transmission unit for transmitting said carrier communication signal carrying said voice signal indicative of said voice information and said tone signal indicative of said data information modulated by said modulating unit, therethrough, and
- 30 said receiving means including:
  - a receiving unit for receiving said carrier communication signal carrying said voice signal indicative of said voice information and said tone signal indicative of said data information transmitted by said transmission means;
  - a demodulating unit for demodulating said carrier communication signal carrying said voice information and said tone signal received by said receiving unit to generate said communication signal;
  - 35 a voice signal filtering unit for filtering said voice signal indicative of said voice information therethrough from said communication signal generated by said demodulating unit;

a tone signal filtering unit for filtering said tone signal therethrough from said communication signal generated by said demodulating unit;

an integral computing unit for sequentially computing integrals of said signal levels of said tones of said tone signal passed through by said tone signal filtering unit, at first predetermined time intervals;

5 a data information computing unit for sequentially computing differences between two respective integrals of said signal levels of said tones of said tone signal computed by said integral computing unit, at respective second predetermined time intervals each starting at a leading point and ending at a trailing point to acquire said data information on the basis of said differences;

10 a data information outputting unit for outputting said data information acquired by said data information computing unit, therethrough; and

15 a voice information outputting unit for outputting said voice information on the basis of said voice signal filtered through by said voice signal filtering unit, therethrough, in accordance with said data information outputted by said data information outputting unit.

2. A communications system as set forth in claim 1, in which said data information computing unit of said receiving means is operative to judge whether said

20 integrals of said signal levels of said tones of said tone signal computed by said integral computing unit are in a predetermined detectable range, and if said data information computing unit judges that said integrals of said signal levels of said tones of said tone signal are not in said predetermined detectable range, said data information computing unit is operative to instruct said integral computing unit of said receiving means to compensate said integrals thus computed so that said integrals thus compensated are in said predetermined detectable range, and said data information computing unit is operative to sequentially compute differences between two respective integrals of said signal levels of said tones of said tone signal compensated by said integral computing unit, at respective second predetermined time intervals each starting at a leading point 25 and ending at a trailing point to acquire said data information on the basis of said differences.

3. A communication method for transmitting and receiving a carrier communication signal carrying a voice signal indicative of voice information and a tone signal indicative of data information, comprising the steps of:

35 (a) transmitting said carrier communication signal carrying said voice signal

and said tone signal; and

(b) receiving said carrier communication signal carrying said voice signal and said tone signal transmitted in said step (a),

said step (a) including the steps of:

5 (a1) inputting said voice information therethrough to generate said voice signal indicative of said voice information;

(a2) inputting said data information therethrough;

(a3) generating said tone signal indicative of said data information on the basis of said data information inputted in said step (a2), said tone signal having a plurality of tones each having a signal level and repeated at predetermined time intervals;

10 (a4) mixing said voice signal generated in said step (a1) and said tone signal generated by said step (a3) to generate a communication signal carrying said voice signal and said tone signal;

15 (a5) modulating said communication signal carrying said voice signal and said tone signal generated in said step (a4) with a carrier signal to generate a carrier communication signal carrying said voice signal and said tone signal;

(a6) transmitting said carrier communication signal carrying said voice signal indicative of said voice information and said tone signal indicative of said data information modulated in said step (a5), therethrough, and

20 said step (b) including the steps of:

(b1) receiving said carrier communication signal carrying said voice signal indicative of said voice information and said tone signal indicative of said data information transmitted in said step (a);

25 (b2) demodulating said carrier communication signal carrying said voice information and said tone signal received in said step (b1) to generate said communication signal;

(b3) filtering said voice signal indicative of said voice information therethrough from said communication signal generated in said step (b2);

30 (b4) filtering said tone signal therethrough from said communication signal generated in said step (b2);

(b5) sequentially computing integrals of said signal levels of said tones of said tone signal passed through in said step (b4), at first predetermined time intervals;

35 (b6) sequentially computing differences between two respective integrals of said signal levels of said tones of said tone signal computed in said step (b5), at respective second predetermined time intervals each starting at a leading point and ending at a trailing point to acquire said data information on the basis of said

differences;

(b7) outputting said data information acquired by said step (b6), therethrough; and

5 (b8) outputting said voice information on the basis of said voice signal filtered through in said step (b3), therethrough, in accordance with said data information outputted in said step (b7).

4. A communication method as set forth in claim 3, in which said step (b6) has the step of (b61) judging whether said integrals of said signal levels of said tones of said tone signal computed by said (b5) are in a predetermined detectable range, and if it is judged that said integrals of said signal levels of said tones of said tone signal are not in said predetermined detectable range in the step (b61), said step (b5) has the step of (b51) compensating said integrals thus computed so that said integrals thus compensated are in said predetermined detectable range, and said step (b6) has the step of (b62) sequentially compute differences between two respective integrals of said signal levels of said tones of said tone signal compensated by said (b51), at respective second predetermined time intervals each starting at a leading point and ending at a trailing point to acquire said data information on the basis of said differences.

20 5. A wireless communications system for transmitting and receiving a radio microphone signal carrying a voice signal indicative of voice information and a tone signal indicative of data information, comprising:

25 at least one wireless microphone transmission apparatus for transmitting said radio microphone signal on a predetermined wireless microphone frequency channel carrying said voice signal and said tone signal; and

30 one wireless receiving apparatus for receiving said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal and said tone signal transmitted by said wireless microphone transmission apparatus, said wireless microphone frequency channel allocated to each of said wireless microphone transmission apparatuses and said wireless receiving apparatus;

35 said wireless microphone transmission apparatus including:

a voice inputting unit for inputting said voice information therethrough to generate said voice signal indicative of said voice information;

a data inputting unit for inputting said data information therethrough;

35 a tone signal generating unit for generating said tone signal indicative of said data information on the basis of said data information inputted by said data inputting

DRAFTING DRAFT

unit, said tone signal having a plurality of tones each having a signal level and repeated at predetermined time intervals;

5        a mixing unit for mixing said voice signal generated by said voice inputting unit and said tone signal generated by said tone signal generating unit to generate a microphone signal carrying said voice signal and said tone signal;

10      a modulating unit for modulating said microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal and said tone signal generated by said mixing unit with a carrier signal to generate said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal and said tone signal;

15      a transmission unit for transmitting said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal indicative of said voice information and said tone signal indicative of said data information modulated by said modulating unit, therethrough, and

20      15      said wireless receiving apparatus including:

25      a receiving unit for receiving said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal indicative of said voice information and said tone signal indicative of said data information transmitted by said wireless microphone transmission apparatus;

30      20      a demodulating unit for demodulating said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice information and said tone signal received by said receiving unit to generate said microphone signal;

35      25      a voice signal filtering unit for filtering said voice signal indicative of said voice information therethrough from said microphone signal generated by said demodulating unit;

40      30      a tone signal filtering unit for filtering said tone signal therethrough from said microphone signal generated by said demodulating unit;

45      35      an integral computing unit for sequentially computing integrals of said signal levels of said tones of said tone signal passed through by said tone signal filtering unit, at first predetermined time intervals;

50      40      a data information computing unit for sequentially computing differences between two respective integrals of said signal levels of said tones of said tone signal computed by said integral computing unit, at respective second predetermined time intervals each starting at a leading point and ending at a trailing point to acquire said data information on the basis of said differences;

55      45      a data information outputting unit for outputting said data information acquired

by said data information computing unit, therethrough; and

5 a voice information outputting unit for outputting said voice information on the basis of said voice signal filtered through by said voice signal filtering unit, therethrough, in accordance with said data information outputted by said data information outputting unit.

6. A wireless communications system for transmitting and receiving a radio microphone signal carrying a voice signal indicative of voice information and a tone signal indicative of data information, comprising:

10 at least one wireless microphone transmission apparatus for transmitting said radio microphone signal on a predetermined wireless microphone frequency channel carrying said voice signal and said tone signal; and

15 a plurality of wireless receiving apparatuses for receiving said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal and said tone signal transmitted by said wireless microphone transmission apparatus, said wireless microphone frequency channel allocated to each of said wireless microphone transmission apparatuses and said wireless receiving apparatuses,

20 said wireless microphone transmission apparatus operative to transmit said radio microphone signal on said predetermined wireless microphone frequency channel to one or more specified wireless receiving apparatuses including:

a voice inputting unit for inputting said voice information therethrough to generate said voice signal indicative of said voice information;

a data inputting unit for inputting said data information therethrough;

25 a tone signal generating unit for generating said tone signal indicative of said data information on the basis of said data information inputted by said data inputting unit, said tone signal having a plurality of tones each having a signal level and repeated at predetermined time intervals;

30 a mixing unit for mixing said voice signal generated by said voice inputting unit and said tone signal generated by said tone signal generating unit to generate a microphone signal carrying said voice signal and said tone signal;

35 a modulating unit for modulating said microphone signal carrying said voice signal and said tone signal generated by said mixing unit with a carrier signal to generate said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal and said tone signal;

a transmission unit for transmitting said radio microphone signal on said

predetermined wireless microphone frequency channel carrying said voice signal indicative of said voice information and said tone signal indicative of said data information modulated by said modulating unit, therethrough, and

said wireless receiving apparatus including:

- 5        a receiving unit for receiving said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal indicative of said voice information and said tone signal indicative of said data information transmitted by said wireless microphone transmission apparatus;
- 10      a demodulating unit for demodulating said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice information and said tone signal received by said receiving unit to generate said microphone signal;
- 15      a voice signal filtering unit for filtering said voice signal indicative of said voice information therethrough from said microphone signal generated by said demodulating unit;
- 20      a tone signal filtering unit for filtering said tone signal therethrough from said microphone signal generated by said demodulating unit;
- 25      an integral computing unit for sequentially computing integrals of said signal levels of said tones of said tone signal passed through by said tone signal filtering unit, at first predetermined time intervals;
- 30      a data information computing unit for sequentially computing differences between two respective integrals of said signal levels of said tones of said tone signal computed by said integral computing unit, at respective second predetermined time intervals each starting at a leading point and ending at a trailing point to acquire said data information on the basis of said differences;
- 35      a data information outputting unit for outputting said data information acquired by said data information computing unit, therethrough; and

a voice information outputting unit for outputting said voice information on the basis of said voice signal filtered through by said voice signal filtering unit, therethrough, in accordance with said data information outputted by said data information outputting unit.

7.      A wireless communications system as set forth in claim 5 or claim 6, in which said data information computing unit of said wireless receiving apparatus is operative to judge whether said integrals of said signal levels of said tones of said tone signal computed by said integral computing unit are in a predetermined detectable range, and if said data information computing unit judges that said integrals of said signal levels of

10 said tones of said tone signal are not in said predetermined detectable range, said data information computing unit is operative to instruct said integral computing unit of said wireless receiving apparatus to compensate said integrals thus computed so that said integrals thus compensated are in said predetermined detectable range, and said data

5 information computing unit is operative to sequentially compute differences between two respective integrals of said signal levels of said tones of said tone signal compensated by said integral computing unit, at respective second predetermined time intervals each starting at a leading point and ending at a trailing point to acquire said data information on the basis of said differences.

10 8. A wireless communications system as set forth in claim 5 or claim 6, in which said data information includes sound level control data information, said data inputting unit of said wireless microphone transmission apparatus is equipped with a sound level control unit for inputting said sound level control data information therethrough, said

15 data tone signal generating unit of said wireless microphone transmission apparatus is operative to generate a tone signal indicative of said data information including said sound level control data information, said wireless receiving apparatus is operative to receive said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal indicative of said voice information and

20 said tone signal indicative of said data information including said sound level control data information transmitted by said wireless microphone transmission apparatus, and said data information outputting unit of said wireless receiving apparatus is operative to output said data information including said sound level control data information.

25 9. A wireless communications system as set forth in claim 5 or claim 6, in which said data information includes a plurality of control data information elements, said data inputting unit of said wireless microphone transmission apparatus is equipped with a plurality of operation switches each for inputting said control data information element therethrough in accordance with an operation mode, and a mode selection switch for

30 inputting mode information therethrough to select said operation mode from among a plurality of operation modes on the basis of said mode information, said data tone signal generating unit of said wireless microphone transmission apparatus is operative to generate a tone signal indicative of said data information including said control data information elements inputted by said operation switch, said wireless receiving

35 apparatus is operative to receive said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal indicative of said

voice information and said tone signal indicative of said data information including said control data information element transmitted by said wireless microphone transmission apparatus, and said data information outputting unit of said wireless receiving apparatus is operative to output said data information including said control data information element.

5

10. A wireless communications system as set forth in claim 5 or claim 6, in which said wireless receiving apparatus is operative to receive said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal  
10 indicative of said voice information and said tone signal indicative of said data information including said sound level control data information sequentially transmitted by one or more wireless microphone transmission apparatuses, and said data information outputting unit of said wireless receiving apparatus is operative to sequentially output said data information including said sound level control data  
15 information.

20. 11. A wireless communications system as set forth in claim 5 or claim 6, further comprising an audio system electrically connected with said wireless receiving apparatus, in which said data information includes audio system control data, said data information outputting unit of said wireless receiving apparatus is operative to output said audio system control data to said audio system, said voice information outputting unit of said wireless receiving apparatus is operative to output said voice information to said audio system, and said audio system is operative to operate in accordance with said  
25 audio system control data.

25

30. 12. A wireless communications system as set forth in claim 5 or claim 6, further comprising an audio-visual system electrically connected with said wireless receiving apparatus, in which said data information includes audio-visual system control data, said data information outputting unit of said wireless receiving apparatus is operative to output said audio-visual system control data to said audio-visual system, said voice information outputting unit of said wireless receiving apparatus is operative to output said voice information to said audio-visual system, and said audio-visual system is operative to operate in accordance with said audio-visual system control data.

35. 13. A wireless communications system as set forth in claim 5 or claim 6, in which said data information outputting unit of said wireless receiving apparatus is capable of

being electrically connected with an external device and outputting said data information to said external device.

14. A wireless communications system as set forth in claim 5 or claim 6, in which

5 said voice information outputting unit of said wireless receiving apparatus is capable of being electrically connected with an external device and outputting said voice information to said external device.

15. A wireless microphone transmission apparatus for transmitting a radio

10 microphone signal on a predetermined wireless microphone frequency channel carrying a voice signal indicative of voice information and a tone signal indicative of data information, comprising:

a voice inputting unit for inputting said voice information therethrough to generate said voice signal indicative of said voice information;

15 a data inputting unit for inputting said data information therethrough;

a tone signal generating unit for generating said tone signal indicative of said data information on the basis of said data information inputted by said data inputting unit, said tone signal having a plurality of tones each having a signal level and repeated at predetermined time intervals;

20 a mixing unit for mixing said voice signal generated by said voice inputting unit and said tone signal generated by said tone signal generating unit to generate a microphone signal carrying said voice signal and said tone signal;

25 a modulating unit for modulating said microphone signal carrying said voice signal and said tone signal generated by said mixing unit with a carrier signal to generate said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal and said tone signal; and

30 a transmission unit for transmitting said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal indicative of said voice information and said tone signal indicative of said data information modulated by said modulating unit, therethrough.

16. A wireless microphone transmission apparatus as set forth in claim 15, in

which said wireless microphone transmission apparatus is operative to transmit said radio microphone signal on said predetermined wireless microphone frequency channel

35 to one or more specified wireless receiving apparatuses.

17. A wireless microphone transmission apparatus as set forth in claim 15, in which said data information includes sound level control data information, said data inputting unit is equipped with a sound level control unit for inputting said sound level control data information therethrough, said data tone signal generating unit is operative  
5 to generate a tone signal indicative of said data information including said sound level control data information.

18. A wireless microphone transmission apparatus as set forth in claim 15, in which said data information includes a plurality of control data information elements,  
10 said data inputting unit is equipped with a plurality of operation switches each for inputting said control data information element therethrough in accordance with an operation mode, and a mode selection switch for inputting mode information therethrough to select said operation mode from among a plurality of operation modes on the basis of said mode information, said data tone signal generating unit is operative  
15 to generate a tone signal indicative of said data information including said control data information elements inputted by said operation switch.

19. A wireless receiving apparatus for receiving a radio microphone signal on a predetermined wireless microphone frequency channel carrying a voice signal indicative of voice information and a tone signal indicative of data information, comprising:  
20

a receiving unit for receiving said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal indicative of said voice information and said tone signal indicative of said data  
25 information;

a demodulating unit for demodulating said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice information and said tone signal received by said receiving unit to generate said microphone signal;

30 a voice signal filtering unit for filtering said voice signal indicative of said voice information therethrough from said microphone signal generated by said demodulating unit;

a tone signal filtering unit for filtering said tone signal therethrough from said microphone signal generated by said demodulating unit;

35 an integral computing unit for sequentially computing integrals of said signal levels of said tones of said tone signal passed through by said tone signal filtering unit, at first predetermined time intervals;

a data information computing unit for sequentially computing differences between two respective integrals of said signal levels of said tones of said tone signal computed by said integral computing unit, at respective second predetermined time intervals each starting at a leading point and ending at a trailing point to acquire said data information on the basis of said differences;

5           a data information outputting unit for outputting said data information acquired by said data information computing unit, therethrough; and

10           a voice information outputting unit for outputting said voice information on the basis of said voice signal filtered through by said voice signal filtering unit, therethrough, in accordance with said data information outputted by said data information outputting unit.

20.          A wireless receiving apparatus as set forth in claim 19, in which said data information computing unit is operative to judge whether said integrals of said signal levels of said tones of said tone signal computed by said integral computing unit are in a predetermined detectable range, and if said data information computing unit judges that said integrals of said signal levels of said tones of said tone signal are not in said predetermined detectable range, said data information computing unit is operative to instruct said integral computing unit to compensate said integrals thus computed so that said integrals thus compensated are in said predetermined detectable range, and said data information computing unit is operative to sequentially compute differences between two respective integrals of said signal levels of said tones of said tone signal compensated by said integral computing unit, at respective second predetermined time intervals each starting at a leading point and ending at a trailing point to acquire said data information on the basis of said differences.

25           21.          A wireless receiving apparatus as set forth in claim 19, in which said receiving unit is operative to receive said radio microphone signal on said predetermined wireless microphone frequency channel carrying said voice signal indicative of said voice information and said tone signal indicative of said data information sequentially transmitted by one or more wireless microphone transmission apparatuses, and said data information outputting unit is operative to sequentially output said data information.

30           35          22.          A wireless receiving apparatus as set forth in claim 19, further comprising a terminal to be electrically connectable with an audio system, said data information including audio system control data, said data information outputting unit operative to

output said audio system control data to said audio system, and said voice information outputting unit operative to output said voice information to said audio system.

23. A wireless receiving apparatus as set forth in claim 19, further comprising a  
5 terminal to be electrically connectable with an audio-visual system, said data information including audio-visual system control data, said data information outputting unit operative to output said audio-visual system control data to said audio-visual system, and said voice information outputting unit operative to output said voice information to said audio-visual system.

10

24. A wireless receiving apparatus as set forth in claim 19, in which said data information outputting unit is capable of being electrically connected with an external device and outputting said data information to said external device.

15 25. A wireless receiving apparatus as set forth in claim 19, in which said voice information outputting unit is capable of being electrically connected with an external device and outputting said voice information to said external device.